Inside INEEL

An inside look at the Idaho National Engineering and Environmental Laboratory

INEEL
Home of Science and Engineering Solutions

Fall 2002
Idaho Falls, Idaho

A facility managed and operated by Bechtel BWXT Idaho, LLC

INEEL going back to the future

Laboratory's mission focus changes to nuclear energy research

The Department of Energy's Idaho National Engineering and Environmental Laboratory is getting back to its roots with last month's mission realignment establishing the Site as the nation's leading center of nuclear energy research and development.

The laboratory, which has been sponsored by the Department's Office of Environmental Management, is in the process of being reassigned to the Office of Nuclear Energy, Science and Technology, where it will become a major contributor to initiatives such as Generation IV nuclear energy systems and advanced, proliferation-resistant fuel cycle technology.

"INEEL will be the epicenter of our efforts to expand nuclear energy as a reliable, affordable and clean energy source for our nation's energy future," said Energy Secretary Spencer Abraham in announcing the realignment. "While environmental cleanup remains a priority for us at Idaho, the importance of advanced, safe nuclear energy for the future demands that we return the Idaho labs to their core mission of nuclear technology research, development and demonstration. This realignment is an important first step to rebuilding our advanced nuclear research capabilities and we look forward to working with Governor Dirk Kempthorne, Senators Larry Craig and Mike Crapo, and the entire Idaho congressional delegation on the transition to a long-term nuclear energy mission."

"We are excited about meeting the challenges of this renewed nuclear energy mission," said INEEL Nuclear and Energy Systems Associate Laboratory Director Jim Lake.

For more than 50 years, INEEL and Argonne National Laboratory-West have led the development and demonstration of nuclear technology and have designed, constructed and operated more than 50 reactors at the Site. The Idaho labs maintain world-class expertise and highly specialized and unique facilities and equipment that cannot be economically replicated. This expertise is critical to developing new, advanced nuclear energy systems. Specifically, the Idaho labs will provide key support to the expanding international Generation IV initiative; the renewal of the nuclear option in the United States

See ***Nuclear Mission*** *Page 2*

PN02-0325-02-20A

U.S. Secretary of Energy Spencer Abraham shakes hands with Idaho Sen. Larry Craig during the official announcement of the INEEL's new mission.

Bioenergy research starts on the farm

Researchers at the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory are partnering with universities and industry to make critical advancements in the fields of agriculture-based bioenergy and bioproducts.

The team will focus on research and development to more fully use the renewable materials from wheat and other crops. Using the biorefining concept, researchers will study how crop residues provide basic chemical building blocks to produce fuels and a range of consumer goods normally produced from petrochemicals.

Unlike petroleum refineries, biorefineries break down agricultural crops and separate them into chemical building blocks, which are used to make products such as fuels and chemicals for plastics and adhesives. Biorefineries are more environmentally friendly because the process of growing crops recaptures the greenhouse gas (carbon dioxide) released by fuels and chemicals. As crop residues are used in biomass refining, the cycle continues.

"This will alleviate our dependence on greenhouse-gas-producing foreign oil. New uses and new markets for the whole wheat crop (i.e., straw and grain) could potentially increase the crop's value sufficiently to put our nation's wheat growers back in the business of profitably producing a wheat crop,"

See ***Bioenergy*** *Page 3*

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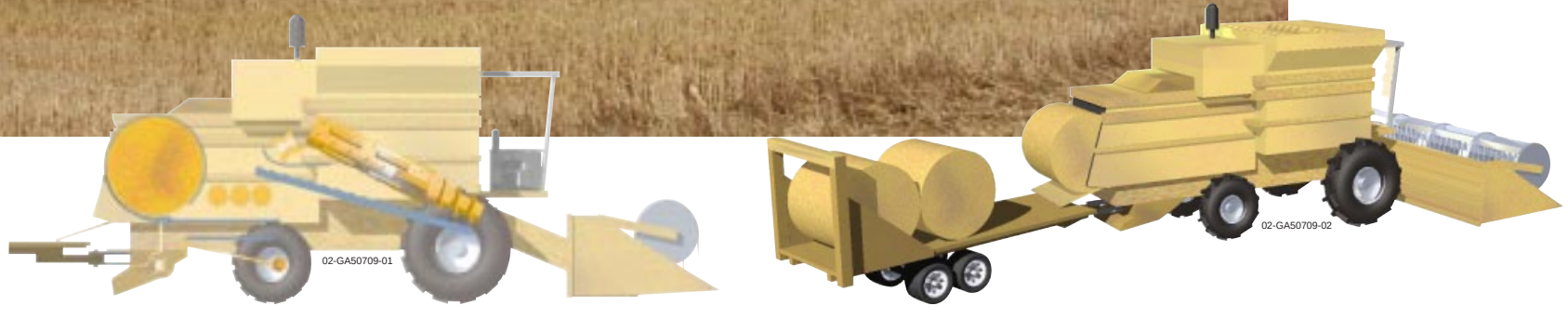
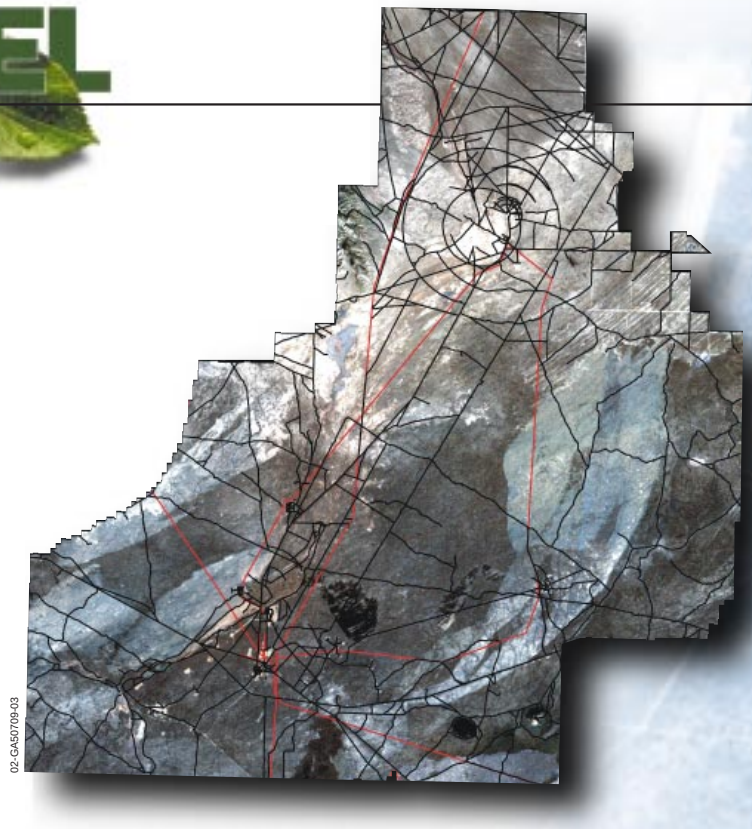


High-tech multicomponent harvesters are being developed to harvest the previously unusable parts of wheat straw for use as a renewable, clean biofuel.

Published by the Idaho National Engineering and Environmental Laboratory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Home, home on the test range?

Life on the land is changing, whether that land serves as a working ranch or a premier national laboratory.

And the key to successfully negotiating that change is a willingness to consider different or additional land uses. Consider the rancher who finds a whole new use for his family homestead beyond its cattle, grain and hay operation. He discovers that tourists will travel to his ranch to share in the hard, yet fulfilling work he performs day in and day out—gathering cows, branding calves and harvesting crops. And those tourists also want to come because of the ruggedly beautiful location. So he uses this new knowledge, invests a little capital and opens a guest operation that he can run right alongside his ranching business. And both enterprises profit from the combination.

The Department of Energy's Idaho National Engineering and Environmental Laboratory is a little like that rancher. For over 50 years, employees at the Laboratory have gone about the business of building reactors, conducting research and supporting programs and customers from the DOE to the military. In the process, they built a site much like a series of small towns, with a mixture of buildings—some large, some small—miles of roads and power lines, wired and wireless communication networks, fire stations, medical dispensaries and even cafeterias.

Now the INEEL has discovered that it has another role, at once different from its routine operations, yet complementary to them and the Site's historic activities. This new vision as a National Critical Infrastructure Test Range comes in part because of the INEEL's extensive facilities and systems, and partially because of its location in an isolated and protected area. It has also arrived because the INEEL has the experts who built and continue to run all of its infrastructure components.

The need for a location to test the critical parts of the nation's infrastructure—like power transmission and communication lines—has always existed. Yet the events of Sept. 11, and the resulting breakdown of important support functions, heightened awareness of the vulnerability of our nation's critical infrastructure.

So as the government and industry seek technologies and processes to strengthen and protect vital infrastructure components, the INEEL offers an ideal location to realistically and safely test them.

The INEEL has already begun this vital work, and more will follow as federal and state agencies discover the capabilities of the Site. Rather than interfere with ongoing operations at the Site, this added activity enhances them as Idaho and its national laboratory become privy to the development of the next generation of advanced U.S. infrastructure technology.

Like the adaptable rancher, the INEEL recognizes and acts upon opportunities to expand business, while never forgetting its main purpose and strengths.

(For more information, call Kathy Gatens, 208-526-1058.)

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The complex network of utilities within the INEEL boundary can be seen in the satellite images at the top of the page. INEEL's size, remoteness, and variety of self-contained facilities make it an attractive site for testing critical infrastructure.

Nuclear Mission

continued from page 1

through the Nuclear Power 2010 program; and the investigation of advanced fuel cycle and related technologies that can optimize the use of repository space.

The Generation IV initiative, both nationally and internationally, will require the development of technologies that make definite advances in safety performance, waste reduction and proliferation resistance, while providing a nuclear energy option that is economically competitive with other energy options anywhere in the world and that will be ready for deployment in about 20 years.

Putting the mission realignment into perspective, INEEL President and Laboratory Director Bill Shipp said, "With the nuclear technology center designation, the INEEL gains in stature and prominence, both at home and abroad. But it's important to note that while we may be the leading center for nuclear energy R&D, this in no way lessens the importance of our cleanup mission, nor our other R&D programs. We will continue as a multipurpose national laboratory serving all the missions of DOE."

(For more information, contact Teri Ehresman, 208-526-7785.)

PN02-0325-02-28A

Secretary Abraham announced his commitment to help jump-start the INEEL's new mission.

Super Hard Steel keeps spotlight shining on INEEL research

Ever wonder what happens to technologies developed at the Department of Energy's Idaho National Engineering and Environmental Laboratory? Just over a year ago, the INEEL announced that materials scientist Daniel Branagan and his team had won an R&D 100 award for a technology called Super Hard Steel. Since then, the phone has been ringing off the hook.

"We've had more than 600 calls from companies interested in evaluating our coating for their specific applications," said Tom Harrison, licensing and technology development coordinator.

Super Hard Steel is a metallic coating created by subtly transforming steel alloy into a noncrystalline metallic glass. Metallic glass has essentially no flaws—making it both hard and tough—perfect for use as a coating. Once sprayed on, the coating has very high resiliency and is extremely difficult to remove. The coating is wear-, corrosion- and impact-resistant—and just the thing for industries where parts wear out quickly.

"Every oil company in the U.S. has approached us for coatings on high-wear parts," said Harrison. The demand for testing material has been so great the INEEL has had to contract with an outside company in St. Louis with facilities big enough to coat and test equipment like drill bits, bicycle parts, rock crushers and auto engine parts.

Harrison is busy negotiating the license for a new company to be based in Idaho Falls that will include facilities for research and development, Super Hard Steel powder production and a spray application.

"We've never had such intense interest in a technology before," Harrison said. "This will undoubtedly be the largest license I will ever negotiate for the INEEL," adding the agreement will augment licensing revenue back to the Lab, and could mean more than 100 new jobs for the area.

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Inventor Daniel Branagan was recently honored by Massachusetts Institute of Technology's *Technology Review* with its TR 100 award for his achievements in developing Super Hard Steel. The award honors the top 100 U.S. researchers under the age of 35. Branagan was also profiled along with 11 other TR100 winning inventors in the June 24, 2002, Forbes ASAP magazine.

(For more information, call Deborah Hill, 208-526-4723.)

Inventor Daniel Branagan was recently honored by Massachusetts Institute of Technology's Technology Review *with its TR 100 award for his achievements in developing Super Hard Steel.*

Bioenergy

continued from page 1

Dusty Tallman, past president of the National Association of Wheat Growers, said in a letter last summer to the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy. "The ripple effect of a profitable farmer creates a solid foundation for sustainable rural economic development."

Because an estimated 50 million tons of usable wheat straw go to waste in the United States each year, the INEEL is working to develop selective harvest technologies for crop residue collection. This crop residue is a sustainable annual resource.

"Not all parts of the plant are of equal value," said J. Richard Hess, a principal scientist on the project for the INEEL. The predominantly fibrous straw stem, high in cellulose, is of greater value for bioenergy, biofuels and bioproducts, while the remaining components (leaves, sheath, nodes, awns, hulls) would be better used by being left in the field to maintain soil organic matter and contribute soil nutrients.

For several years, the INEEL has worked with a major manufacturing company and Iowa State University to develop a single-pass, multi-component combine that will separate both the grain and stems from straw. The research focuses on reducing harvesting costs by limiting harvesting to a single pass across the field; using straw components for the most desirable end-use; and increasing the total biomass available for harvest, said Reed Hoskinson, a principal scientist on the project.

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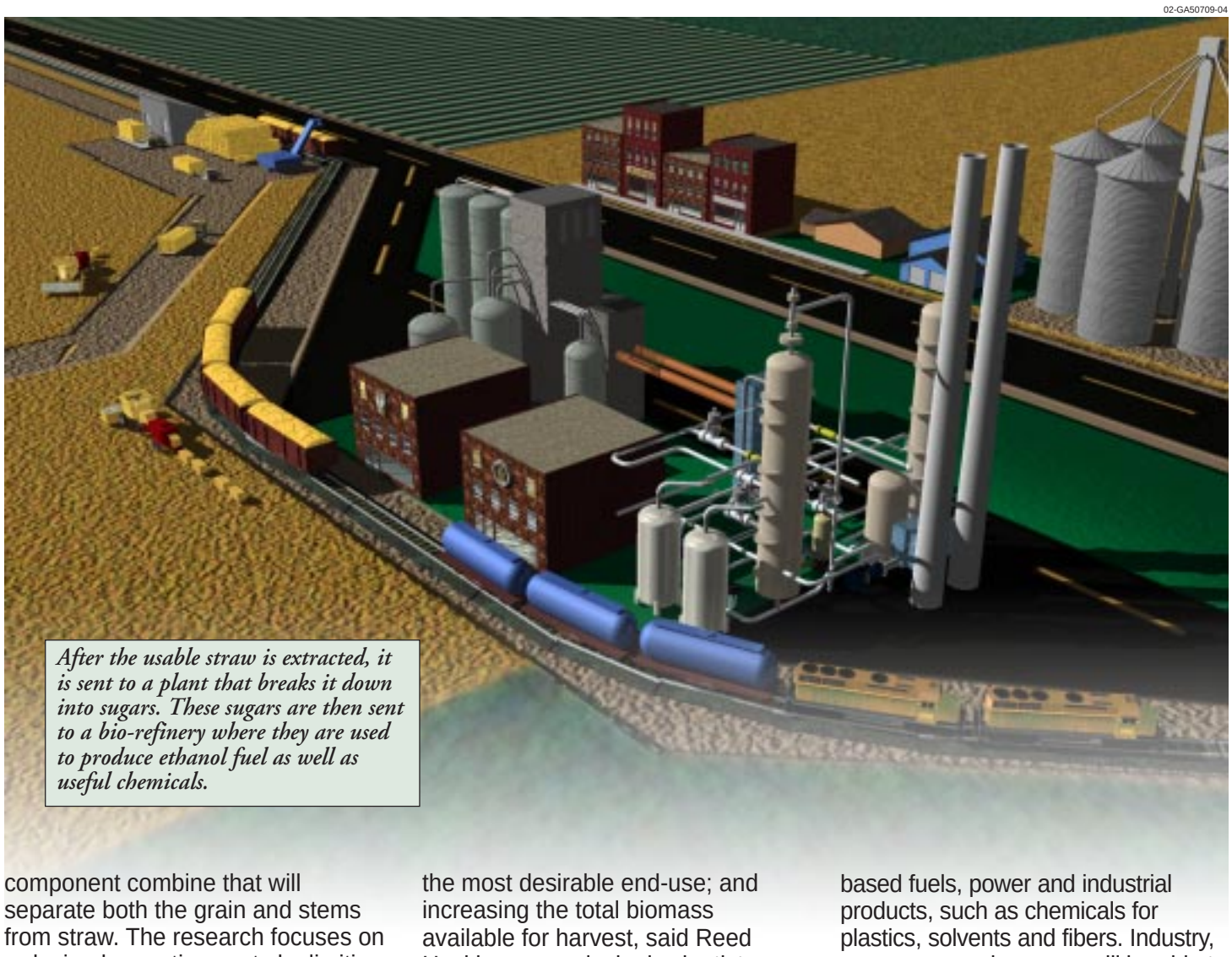

After the usable straw is extracted, it is sent to a plant that breaks it down into sugars. These sugars are then sent to a bio-refinery where they are used to produce ethanol fuel as well as useful chemicals.

"The coupling of the physical and fluid dynamics modeling in virtual reality is greatly aiding in the design of the multicomponent harvester," said Tom Foust, INEEL's initiative team leader.

Last month, the INEEL partnered with DOE's Pacific Northwest National Laboratory in Richland, Wash., Washington State University and University of Idaho to form a Northwest Bioproducts Research Institute. The four partners will collaborate to develop a nationally renowned, multidisciplinary research and development program. They will examine and develop methods for converting agricultural and food processing residue wastes into bio-based fuels, power and industrial products, such as chemicals for plastics, solvents and fibers. Industry, processors and growers will be able to use and profit from the institute's products and technologies and, in some cases, profit from the discoveries through licenses.

"To the degree possible, research conducted in this institute will contribute to the nation's need to reduce its dependence on foreign oil and provide low-cost energy," said Bill Shipp, INEEL president and Laboratory director. "Demand for petroleum feedstocks for products, fuels and power production continues to increase, and the institute will strive to address this increase by enabling the use of agricultural resources to partially offset this demand."

(For more information, contact Teri Ehresman, 208-526-7785.)

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INEEL posts a decade of environmental cleanup progress

Since 1991, more than a decade ago, the Department of Energy, the state of Idaho and the federal Environmental Protection Agency have signed several legal agreements that detail numerous cleanup tasks and stipulate deadlines for completing the work. Those agreements presented the Idaho National Engineering and Environmental Laboratory a considerable job. Part of meeting these challenges meant organizing the Site's environmental restoration activities around the nine INEEL facility areas, with a separate organizational unit for miscellaneous sites including the Snake River Plain Aquifer.

The issues facing the INEEL were complex.

Across the INEEL's 890-square-mile area (including Argonne National Laboratory-West and Naval Reactors Facility areas) 355 potential contaminant release sites were identified. They contained millions of gallons of contaminated groundwater, hundreds of acres of contaminated soil, radioactive waste buried underground and numerous uncharacterized landfills, wastewater ponds, underground storage tanks and unexploded ordnance sites.

Many of the INEEL's activities, as part of its contribution to the nation's Cold War effort, left waste that needed treatment. This waste included 2.3 million gallons of high-level waste at the Idaho Nuclear Technology and Engineering Center tank farm, 65,000 cubic meters of uncharacterized transuranic waste in temporary storage with no place to go and large volumes of low-level and mixed low-level radioactive waste (waste with both radioactive and hazardous or chemical material), much of it awaiting shipment off the INEEL.

In 1991, most spent (used) nuclear fuel, was stored under water in old facilities.

Finally, hundreds of unused and contaminated buildings from past projects were sitting idle and needed attention.

As part of the Federal Facility Agreement and Consent Order, the strategy for cleanup was to show a "bias for action." This meant that while final actions on the issues were still being considered, the INEEL would aggressively pursue interim cleanup steps to protect human health and the environment.

By 2001, the INEEL had completed more than 70 percent of the Federal Facility Agreement and Consent Order enforceable remediation milestones identified in 1991. Of the potentially contaminated release sites originally identified in 1991, another 125 potential release sites have been identified. To date, 315 sites have been remediated or a decision made that no action is necessary.

Decisions were made on remedies to apply to 22 of the 26 major areas needing remediation. These decisions, known as Records of Decision, are agreed to by DOE and the agencies. Remediation has been completed for 10 decisions, work is ongoing for another eight and four decisions are in the remedial design phase. Only four decisions need to be made.

The INEEL removed more than 107,000 pounds of organic compounds (in the form of gases) from beneath the Radioactive Waste Management Complex. These gases could contaminate the Snake River Plain Aquifer.

The Laboratory completed treating more than 119 million gallons of contaminated groundwater. Workers capped, backfilled and grouted or otherwise stabilized three landfills, two wastewater ponds, two burial grounds and an aboveground disposal pad for transuranic waste (waste that contains radioactive elements such as plutonium and americium).

Large volumes of unexploded ordnance, left from the INEEL's

1991 — *The Roots of Environmental Management*

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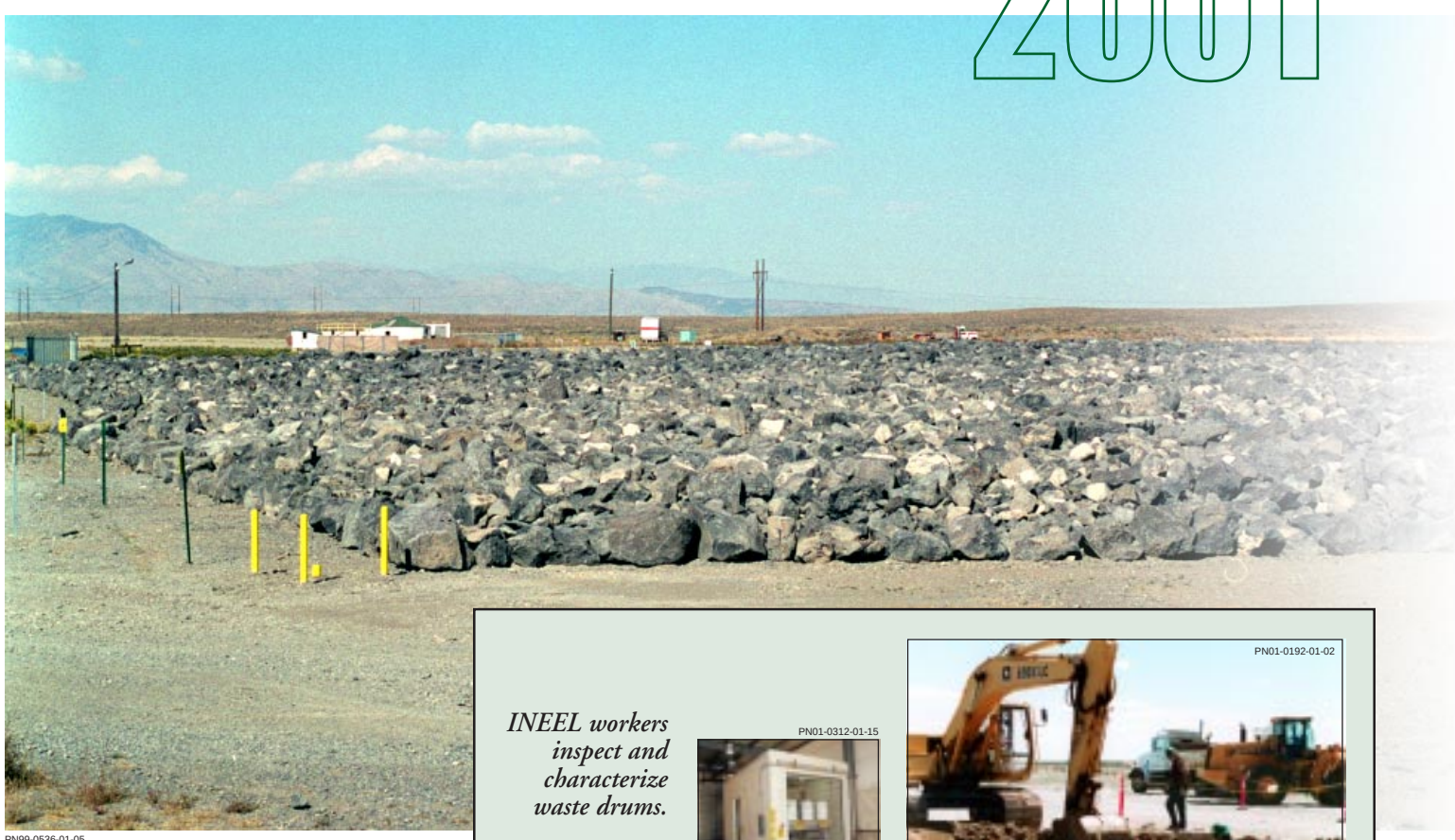
In 1991, the INEEL began the considerable task of cleaning up the contamination and waste that had been left by past operations. Agreements were signed with the state of Idaho and the Environmental Protection Agency to ensure cleanup was accomplished in a timely manner.

2001 — *One Decade Later*



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The INEEL has successfully remediated the warm waste ponds at the Test Reactor Area. The remedial action included covering the ponds with an engineered cap to reduce water infiltration and intrusion by animals.

INEEL workers inspect and characterize waste drums.

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Workers remove tanks and soil during remediation activities.

days as a naval gunnery range, have been safely exploded or removed.

The volume of liquid radioactive waste in the underground tank farm at the Idaho Nuclear Technology and Engineering Center was dramatically reduced to less than one million gallons. Five of the 11 tanks have been emptied down to the “heel” (residue in the bottom of the tanks).

From 1991 to 2001, the INEEL shipped more than 1,800 cubic meters of transuranic waste to the Waste Isolation Pilot Plant in New Mexico. As of mid-July 2002, the INEEL has shipped more than 2,030 cubic meters and is approaching completion of the project to ship 3,100 cubic meters by the end of December 2002—a requirement of the Idaho Settlement Agreement.

During the decade, the Advanced Mixed Waste Treatment Project, designed to prepare transuranic waste for shipment to WIPP, reached the 58 percent completion stage. As of July 2002, the project is 80 percent complete.

The INEEL has treated and disposed of some 2,780 cubic meters of mixed radioactive and hazardous waste off site and disposed of more than 25,000 cubic meters of low-level waste.

The INEEL made significant progress in storing spent nuclear fuel. Some 82 metric tons heavy metal of Three Mile Island-II spent nuclear fuel and core debris was moved from under water storage to dry storage. Spent fuel stored under water in the aging CPP-603 storage basin was removed into either dry storage or the more modern water storage pools at the Site. Spent nuclear fuel in the Material Test Reactor canal was repackaged to prepare for dry storage.

The INEEL decontaminated and decommissioned 103 structures, of which 223,000 square feet were contaminated.

A decade of action has reduced the risk to workers, the public and the environment.

(For more information, contact Stacey Francis, 208-526-0075.)

INEEL team designing next generation of robots

Who dreams up James Bond’s toys? Who designs the laser-emitting cuff links and the wristwatch satellite phone that gadget wizard Q so assiduously describes before each new adventure? Is there a laboratory tucked away where white-coated, bespectacled scientists craft new weapons to fight the ever-cunning adversary?

Super-sleuth 007 and his gadgets may be creations of author Ian Fleming and the movie industry but those imaginative behind-the-scenes fellows in lab coats do exist. Some of them work in the INEEL’s National Security Division.

Many products built in National Security’s laboratories are battle- and field-tested and are hard at work for the U.S. military at home and abroad. Mobile INEEL-developed technologies assist Army units in identifing and safely handling chemical munitions. Other INEEL systems coordinate air support for ground troops, while still others help Air Force pilots avoid enemy radar and weapons.

But all of these advanced technologies started on the drawing board with novel ideas, followed by sound research and comprehensive testing. One such project still being designed and refined for final assignment—perhaps for the streets of the capital or the mountains of Afghanistan—is the Tactical Mobile Robot.

National Security engineer Mike Occhionero leads a team designing tools for this next-generation robot, called Packbot.

Packbot is a tough, little robot developed by iRobot of Somerville, Mass. Small in size—but durable and versatile—Packbot was designed to venture into areas too dangerous for people. The value of robots in real-world situations was demonstrated when—after the collapse of the World Trade Towers—Packbots helped in search-and-rescue operations.

“TMR (Tactical Mobile Robot) is not yet a mature technology,” explains Occhionero. “There are many potential uses and payloads we are looking to demonstrate. We want to prove the technology is robust enough for military or police operations.”

To protect Packbot on dangerous missions, INEEL engineers are devising lightweight armor protection. But the team’s unique approach is not to make a little tank out of Packbot which would increase its weight and decrease its maneuverability.

“You don’t have a choice with a person. You have to armor vulnerable areas,” says Occhionero. “It’s different with a robot. We can move things around on the inside.” He is talking to Packbot developers about remaking key components from armor material. The team is developing a concept to “compartmentalize” internal components.

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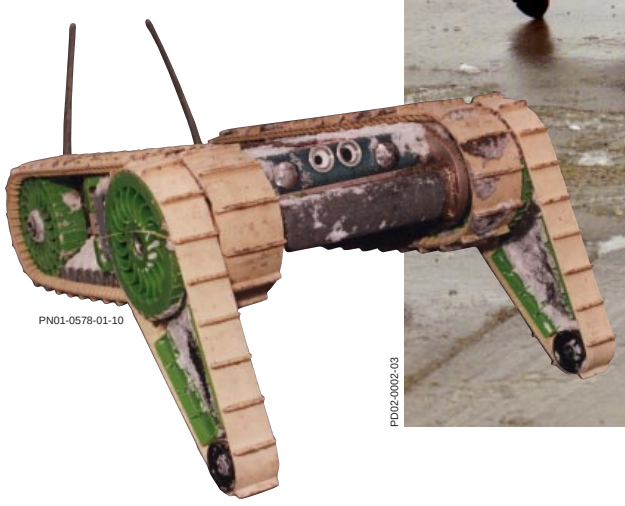
Julio Rodriguez demonstrates the Packbot robot to children at Templeview Elementary School (top and left). Jon Long of the INEEL Special Operations Team (prone) and Doug Evanic of Security Operations (seated) align a machine gun before mounting it on the robot (below).

Occhionero’s team is also developing an offensive payload. It is equipping Packbot with a Fabrique National M-249 machine gun and demonstrating its ability to engage targets and to fire remotely. With this application, the robot could protect U.S. soldiers or divert enemy forces.

Packbot also has a “softer side.” Occhionero takes a benign version to grade schools. He runs the robot through its paces, all the while talking about engineering skills needed to work with robots. The students seem enthralled, and Occhionero hopes to encourage that next generation of scientific tinkerers.

Q would have been proud.

(For more information, call Kathy Gatens, 208-526-1058.)



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Becoming science smart at the INEEL


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As the bell sounds signifying the beginning of another school year, teachers across Idaho will return to the classroom to teach the leaders of tomorrow. But for a select group of teachers participating in a special summer education program at the INEEL, the bell means only that the classroom has changed locations.

For the past three months, these teachers have been solving math, science and engineering challenges working side-by-side with some of the best scientists and engineers the world has to offer.

The program, Teaming Teachers with the INEEL (TTI), is one of several at the INEEL designed to assist students and teachers from all over the country to become better at teaching and learning about math and science.

TTI, developed by the INEEL's Education and Research Initiatives (E&RI) Department, aims to provide strategic leadership in educational and laboratory-directed research activities. The summer programs bring together teachers and students to help ensure a future work force that will further the long-term mission of the INEEL.

"Our pre-college programs are an exciting way to impact the state of Idaho as well as the future of the Laboratory," said Sandra Feldman, manager of Education Relations.

TTI, one of eight pre-college programs, places practicing teachers with INEEL scientific and technical experts working on real-world problems. This allows teachers to gain valuable knowledge on how researchers solve real challenges. The experience helps them enhance how they teach students.

In another program, high school students and teachers team with INEEL researchers to form a Student Action Team (SAT), where they can apply concepts learned in class into a setting not typically available in most high school curricula. TTI and SAT last for eight weeks. Both students and teachers receive stipends for their participation.

"I've been involved in the SAT program for four years, and each year, my experiences at the INEEL have a direct benefit to 150 science students in my school's district," said Firth High School science teacher Stewart Portela. "The opportunities that I have been given through this program have enhanced my teaching more than anything else I have done in my 20 years as an educator."

As the result of work done by one SAT, two high school students from Idaho Falls traveled to Orlando, Fla., to present a software program the group developed on microbial growth at the General Meeting of the American Society for Microbiology.

In addition to the programs offered in the summer, pre-college education provides a wide array of science and math enhancement activities at other times of the year to help stir the minds of Idaho students.

JASON Idaho offers Idaho middle school students a hands-on scientific journey via online reports and a live satellite link with remote locations throughout the world. The JASON project also provides Idaho students and teachers with a year-round curriculum to augment learning.

The INEEL Scholastic Tournament is a math and science academic quiz bowl competition. Based on their success in regional competitions, three Idaho high schools advance each year to the DOE-sponsored National Science Bowl in Washington, D.C. Approximately 1,000 students representing 80-85 high schools participate in the Idaho competition each year.

Also reaching out to secondary education needs, University Programs focus on students and faculty who attend college and come to the INEEL to pursue advanced degrees, conduct post-doctoral work and serve internships.

"When we see undergraduate and graduate students who have been in our summer programs hired as permanent employees, then we know our programs are working," said Feldman. "And we are seeing those results."

Over 200 students and faculty each year take advantage of the university programs available at the INEEL.

Undergraduate fellowships for students attending college provide from 10 to 16 weeks of full-time summer research experience with an INEEL mentor, or on a college or university campus under the supervision of a faculty researcher.

Fellowships for graduate students are designed to assist those pursuing a master's or doctoral degree and who would like to conduct research applicable to a thesis, dissertation or project.

For teachers and students, when the bell sounds in Idaho this school year, becoming math and science smart will have been made easier, thanks to the INEEL.

(For more information, call Steve Zollinger, 208-526-9590.)


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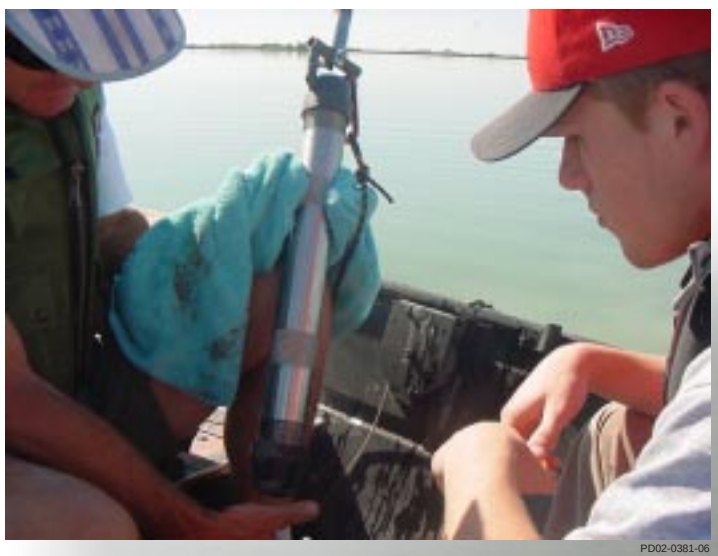
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Firth High School science teacher Stewart Portela (photo at top of page) and Mike Abbott (bottom photo) help students get their feet wet in some hands-on science field work at Mud Lake. In the Student Action Team Program, high school students and teachers team with INEEL researchers where they can apply concepts learned in class into a setting not typically available in most high school curricula.


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02-GA50709-05

INEEL's Subsurface Science Initiative – where we are today

Since researchers at the Department of Energy's Idaho National Engineering and Environmental Laboratory set their sights on subsurface science as a major research initiative two years ago, they've made a lot of progress. The ultimate goal of the Subsurface Science Initiative (SSI) is to develop and validate reliable predictive models of contaminant movement in the subsurface, design robust containment systems and reliable, durable monitoring systems. Here's what researchers have done so far.

With the help of Bechtel National, INEEL's corporate parent company, the Lab is establishing the Geocentrifuge Research Laboratory in Idaho Falls. The heart of this new facility is a 2-meter radius centrifuge that spins soil and rock material in a wide circle to increase the gravitational force on the sample. For experiments to learn how fluids flow in unsaturated rocks, this simulates an accelerated passage of time for the sample material and enables researchers to study in a few days or weeks the effects of tens of years of gravity-induced fluid movement. This type of experiment is important in understanding how downward-moving waters might carry contaminants, so researchers plan to use this new tool to study fluid flow through samples that reflect the INEEL's subsurface environment. For more information about this facility and opportunities for tours or collaborations, visit this web site: http://www.inel.gov/env-energyscience/centrifuge

Researchers also are developing a new experimental system designed for studying the physics of the geological environment. This will enable them to find out how good existing sensors and imaging instruments are, and ultimately to create more accurate models of the subsurface. The most visible feature will be a large tank (10 x 10 x 10 feet) that will let researchers create realistic physical models of the subsurface with precisely controlled features. The facility will include an automated data acquisition system and high-precision instrument probe systems.

Earlier this year, researchers completed the conceptual design for a new 200,000-square-foot Subsurface Geosciences Laboratory to be built in Idaho Falls. The facility will enable researchers to conduct experiments large enough in scale to accurately mimic the complex, real-world workings of the subsurface. When completed, this lab will house a combination of unique research equipment and capabilities found nowhere else, making it a world-class research facility. The SGL will be a user facility where scientists from around the world can come and use the equipment to perform their own experiments or collaborate with INEEL staff. For more information about the planned facility, visit this web site: http://subsurface.inel.gov/information/sgl.asp

The INEEL also put the last two years to good use by recruiting key staff from universities, other national laboratories, and industry to complement existing staff. So far, the INEEL has hired 14 new researchers. The Laboratory is assembling a strong, vibrant multidisciplinary team to shape the research program and tackle some of the most complex, difficult problems facing the DOE and nation.

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Artist's rendering and site plan of the Subsurface Geosciences Laboratory (1-2). Mesoscale experiment (3). Technicians unpack a 2-meter radius centrifuge that will be the heart of the new Geocentriguge Research Laboratory (4-6).


PN02-0156-13-11


PN02-0156-11-20A


PN02-0156-13-08

INEEL researchers led the development of a long-term national research agenda to increase vadose zone knowledge—the vadose zone is the area below the earth's surface and above the water table. The vadose zone, once thought to be relatively stable and "unsaturated" with water, actually hosts many extremely complex and often site-specific natural processes—geological, hydrological, chemical and biological. The National Roadmap for Vadose Zone Science and Technology identifies the gaps in our understanding of the subsurface and will guide future research efforts across the DOE complex of cleanup sites. Information on the report is available at http://www.inel.gov/vadosezone/

Researchers are working hard with the Inland Northwest Research Alliance (www.inra.org) partners to establish better high-speed network connections among INEEL researchers and the universities to foster more effective research collaboration. The INEEL also plans to lease part of the planned Idaho State University/University of Idaho Center for Science and Technology—to be built in Idaho Falls—to encourage stronger relationships between university teaching staff, and visiting or permanent INEEL research staff.

For more information about the INEEL's Subsurface Science Initiative, visit this web site: http://subsurface.inel.gov.

(For more information, call Deborah Hill, 208-526-4723.)

The INEEL has recruited key staff from universities, other national laboratories, and industry. These include (clockwise from top left) Robert Lenhard, Paul Meakin, Gill Geesey, and Russ Hertzog.

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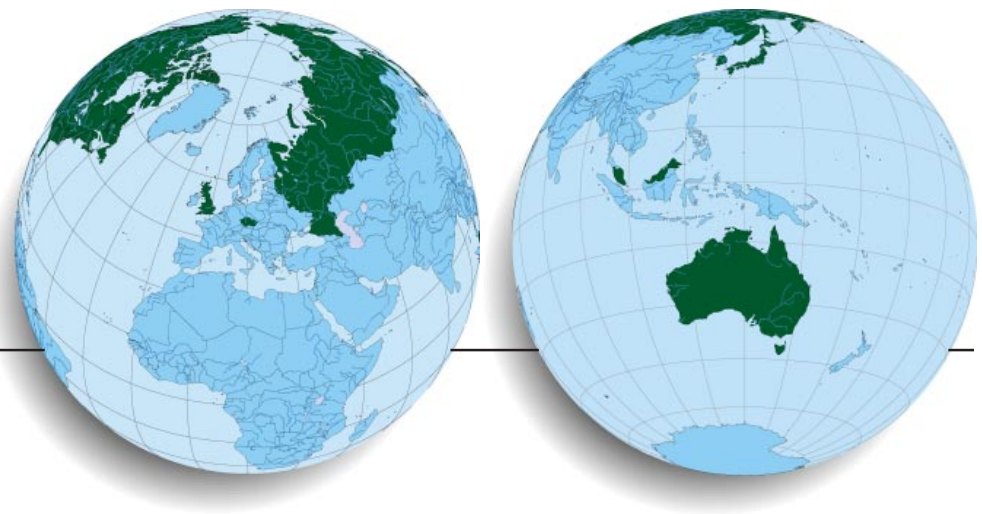
World environment benefits from INEEL solutions



In addition to emerging collaborations around the globe, the INEEL is working in numerous ways with the countries illustrated in green above.

Imagine yourself as an environmental engineer in Kuala Lumpur facing the prospect of cleaning up industrial brownfields. Suppose you're a member of a joint Japanese/Canadian drilling expedition researching methane hydrates in deep geologic environments. Or what if you're an engineer on the northern coast of Scotland planning to decontaminate and decommission nuclear facilities. Where in the world would you go for advice and technology to solve these problems?

If you're thinking the answer in no way involves Idaho—think again. The common denominator for each of these and similar situations around the globe is the INEEL—the Department of Energy's Idaho National Engineering and Environmental Laboratory.

"The INEEL is increasingly referred to in the most diverse scientific and technical circles in the world," says Harold Blackman, INEEL associate laboratory director for Environmental Technology, Engineering and Life Sciences. "Our standing in the international community is based on the reputation of scientists and engineers who get results through solid environmental research and applied engineering work."

INEEL and Malaysian officials discuss how INEEL's experience in setting up, managing and carrying out a major cleanup program could benefit Malaysia.

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For example, in Asia, the INEEL and the Tokyo-based Obayashi Corporation joined to commercialize an underground waste containment barrier and monitoring system. From South Korea, electric power employees have been trained at the INEEL to decontaminate and decommission nuclear power reactors.

The INEEL joined a partnership with the state of Idaho and Idaho universities to provide a framework for addressing environmental contamination in Malaysia. The partnership is developing an Asian/Pacific Environmental Center to seek new business and offer environmental solutions in the Pacific Rim.

The INEEL works with the Russian Research Center "Kurchatov Institute" to characterize and remediate radiologically contaminated facilities to prevent contaminant migration and protect groundwater. It also works with the Russian Khlopin Radium Institute to improve a process that was jointly developed by U.S. and Russian scientists to separate radioactive material from nuclear waste.

From down under, the Australian Nuclear Science and Technology Organization asked the INEEL to design a liquid waste treatment process and off-gas collection system to handle, treat and dispose of uranium metal used to produce medical isotopes.

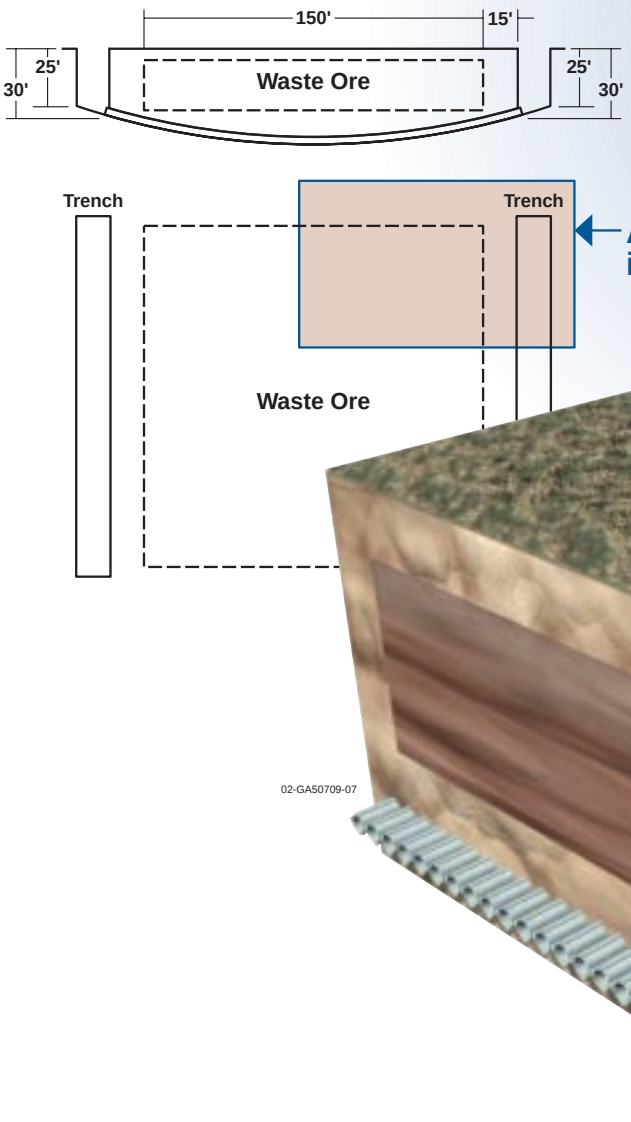
Within Europe, the INEEL works with the United Kingdom Atomic Energy Authority at its Dounreay, Scotland, site to select a high-level waste stabilization process, explore tank farm clean-out technologies, advise on spent fuel technologies and discuss long-term environmental monitoring. The INEEL also works with a Czech Technical University professor to improve new sorbent material, or extractants, that remove large volumes of specific contaminants from liquids in a short time. This technology could be used to clean up streams where contaminants pose a threat.

In North America, the INEEL works with Atomic Energy of Canada Limited to review plans for removing mercury from waste processing tanks, and advise on spent nuclear fuel dry storage and high-level tank waste treatment technologies.

INEEL microbiologists were invited by the Geological Survey of Canada and the Japan Petroleum Exploration Company to participate in preparing a research proposal for the International Continental Drilling Program. The INEEL was sought out because of its microbiologist team's experience in sampling and characterizing deep geologic environments.

In another unique collaboration, an INEEL microbiologist was invited by the international Ocean Drilling Program to participate in scientific drilling for concentrations of methane hydrates off the Oregon coast.

(For more information, call Reuel Smith, 208-526-3733.)



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